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## ***COST OF PRODUCING SOYBEANS IN THE U.S., 1974***



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by Alan S. Walter

## COST OF PRODUCING SOYBEANS IN THE U.S., 1974

By

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**ABSTRACT:** The cost of production for soybeans in 1974 was estimated through an enumerative survey. The average total cost, excluding land, was \$69 per harvested acre of which \$53 was for direct components. On a per bushel basis, total cost, excluding land, averaged \$2.79 at the survey average yield of 24.7 bushels per acre, or 10 percent higher than the costs projected for a more 'normal' 1974 crop year. Land allocations were estimated by six alternative procedures with a range in the national average of \$29 to \$71 per acre or \$1.18 to \$2.90 per bushel. These costs varied substantially among subregions and among farms.

**KEYWORDS:** Soybeans, costs, cost of production.

The Economic Research Service has estimated 1974 costs of production for soybeans in 19 U.S. subregions and a weighted national average. These costs were obtained as a part of a study mandated by the Agriculture and Consumer Protection Act of 1973 to provide cost estimates for wheat, feed grains, cotton, and milk.<sup>1</sup> These cost estimates will be updated and published annually by ERS for soybeans and other commodities.

One purpose of the study was to estimate average total costs of producing soybeans. Total costs include variable costs for purchased inputs and fixed costs for machinery, overhead, and land. Charges for inputs on all acres planted, even though some may not have been harvested, are included. A second objective of this study was to estimate variability in costs among subregions and among producers.

Most of the data used to estimate the costs were obtained from an enumerative survey of individual producers. The survey was conducted in January and February 1975, with a total of 1,655 usable schedules obtained from soybean producers. The

sample was restricted to farms with cropland acreage adequate to support a full-time operator. Producers in counties having less than 10 percent of total land area in cropland were excluded. The survey, as a result of the exclusion of the above mentioned producers, represents 74 percent of the 1974 acreage. The designations of subregions in which soybean producers were sampled and for which costs estimates were made are encircled in the accompanying map.

Most of the cost computations were straightforward with full details of procedures and assumptions explained in the full report (see footnote 1). However, some explanation related to the calculation of management and land allocations which are often not shown as costs of production may be useful.

A charge for management was particularly difficult to establish because the management input is usually rewarded by "profit." To allow *total costs* to be estimated, a charge of 7 percent of the gross value of soybean production was allocated for management.

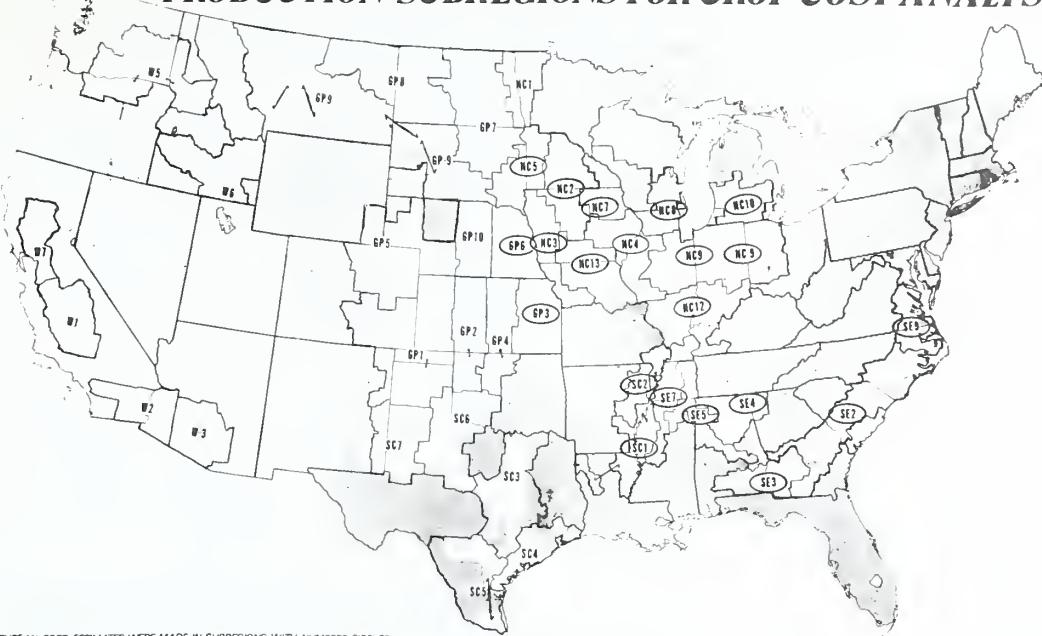
The calculation of total costs also required an allocation be made for land. There is no single procedure for determining an allocation for land that is appropriate for all purposes, and for some purposes such as short-term supply responses such a charge may be omitted.

Land allocations have been computed in this study by six alternative methods: *Method (1)*—an interest charge was made on the value of land equivalent to current prices paid for agricultural purposes; *Method (2)*—an interest charge was made

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<sup>1</sup>The full report on the 1974 costs of production for wheat, feed grains, cotton, soybeans, peanuts, and flaxseed prepared by ERS was published by the U.S. Senate Agriculture and Forestry Committee. Refer to committee print No. 63-092 *Cost of Producing Selected Crops in the United States, 1974*, U.S. Government Printing Office, Washington, D.C., 1976.

## PRODUCTION SUBREGIONS FOR CROP COST ANALYSIS



AD 4045

on the estimated agricultural value at time of acquisition by the present owner; *Method (3)*—net share rents were estimated under the assumption that all land was share rented; *Method (4)*—cash rent was estimated under the assumption that all land was cash rented; *Method (5)*—a composite including actual combinations of cash rent, share rent, and owner-operator arrangements with owner-operated land valued at current prices was calculated; and *Method (6)*—same as Method (5) except owner-operated land was valued at the estimated value at time of acquisition by the present owner. One of these allocations should be appropriate for most purposes.

## RESULTS

### National Highlights

The average total cost, excluding land, for producing soybeans in 1974 was \$69 per harvested acre. Direct costs—which include labor, power and equipment, materials, custom services, and interest on operating capital—averaged \$53 per acre and accounted for 77 percent of the nonland total. Two direct cost items—power and equipment, and materials—each accounted for about 30 percent of the total excluding land. Labor averaged \$7 per acre or somewhat less than 10 percent of the nonland items. Custom services and interest on operating capital averaged \$2.50 per acre and \$1.83,

respectively. Indirect components of overhead and management averaged \$6 and \$10 per acre, respectively.

The six alternative averages of land allocations ranged from \$29 to \$71 per acre. The importance of land values on the total costs of production is shown by comparing method 1 of calculating the land allocation with method 2 and method 5 with method 6. A substantial increase in prices paid for farm land in recent years caused the method 1 allocation to be three times that of method 2 and method 5 to be \$15 per acre above the method 6 average.

Total cost per bushel, excluding land, at survey yields averaged \$2.79, of which direct items accounted for \$2.16. Overhead and management averaged \$0.24 and \$0.39, respectively. Land allocations ranged between a low of \$1.18 (using method 2) to a high of \$2.90 (method 1). The lowest composite, (method 6) averaged \$1.82 compared to \$2.43 per bushel for the composite that used the current agricultural value of land (method 5).

The weather in the 1974 crop year was extremely unfavorable in some soybean growing areas. To allow comparison with more "normal" yields, per bushel costs are also shown in table 22 assuming the 1974 yield would have been consistent with the trend in yields from 1965-74. The survey yield of 24.7 bushels was approximately 10 percent below the statistically derived trend yield

Table 22--Soybeans: Production costs per acre harvested and per bushel, by cost item, U.S., 1974 1/

Item	Cost per	Cost per bushel	Cost per bushel at
	acre	using survey yields	trend yield <u>2/</u>
	: - - - - - Dollars - - - - -		
Labor	: 6.54	: 0.27	: 0.24
Power and equipment	: 21.84	: .89	: .80
Fuel and lubricants	: 6.65	: .27	: .25
Repairs	: 4.06	: .16	: .15
Reserve for replacement	: 6.84	: .28	: .25
Interest and rental	: 4.28	: .18	: .16
Materials	: 20.48	: .83	: .75
Seed	: 8.75	: .35	: .32
Fertilizer and lime	: 4.79	: .19	: .18
Insecticides and fungicides	: .43	: .02	: .02
Herbicides	: 6.40	: .26	: .24
Other materials	: .10	---	---
Custom services	: 2.50	: .10	: .09
Interest on operating capital	: 1.83	: .07	: .07
TOTAL DIRECT COSTS	: 53.18	: 2.16	: 1.96
Overhead	: 6.00	: .24	: .22
Management	: 9.67	: .39	: .36
TOTAL EXCLUDING LAND	: 68.85	: 2.79	: 2.54
Alternative land allocations:	:	:	:
Ownership basis:	:	:	:
At current land value <u>3/</u>	: 71.49	: 2.90	: 2.63
At average acquisition value <u>4/</u>	: 29.10	: 1.18	: 1.07
Share rent basis <u>5/</u>	: 59.70	: 2.42	: 2.20
Cash rent basis <u>6/</u>	: 36.40	: 1.48	: 1.34
Composite basis:	:	:	:
At current land value <u>7/</u>	: 60.02	: 2.43	: 2.21
At average acquisition value <u>8/</u>	: 44.96	: 1.8?	: 1.66

1/ Only non-irrigated production is shown. The omission of irrigated production had very little impact on major cost categories. Items in this table may not add due to rounding.

2/ Using linear regression for national average yields from 1965 through 1974 gave a 1974 trend line yield of 27.1 bushels per acre in comparison to survey yields of 24.7 bushels. Per acre costs were assumed the same under both yield alternatives. The figures shown under trend yield may slightly underestimate costs since some items such as harvesting could have been higher with increased yields.

3/ Based on estimated current agricultural value of cropland multiplied by current rates of interest on Federal Land Bank mortgage loans.

4/ Based on estimated average value of cropland at time of acquisition by present owners multiplied by current rates of interest on Federal Land Bank mortgage loans.

5/ Net share rent is the landlord's share of crop receipts minus his share of the crop expenses. If the operator did not share rent, prevailing share rent terms in the subregion were applied.

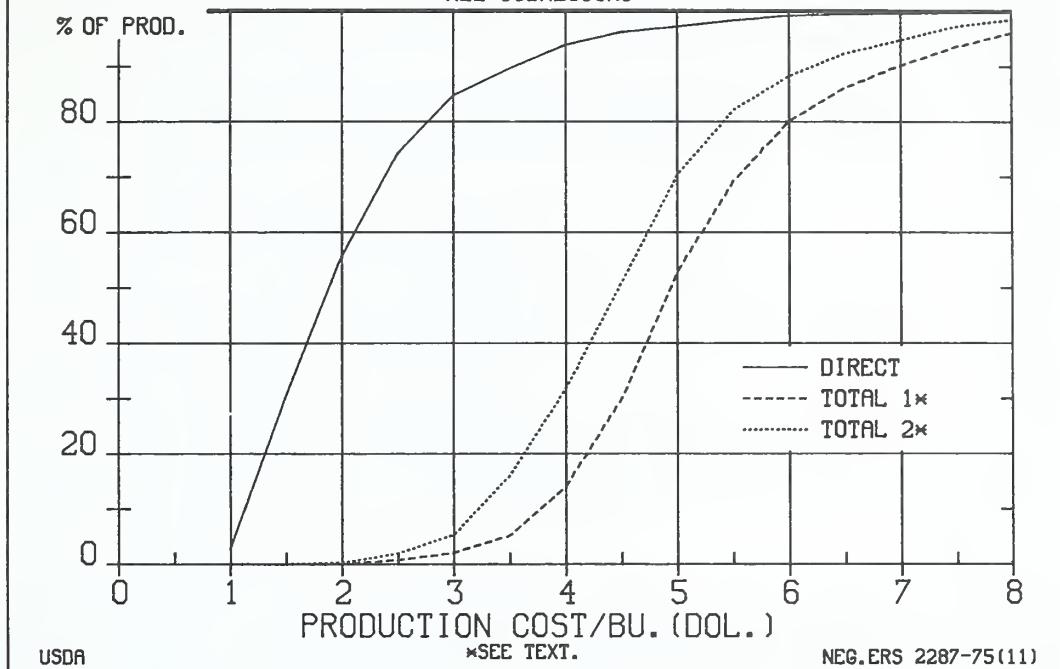
6/ Based on average cash rent payments per acre of cropland. If the operator did not cash rent, prevailing average cash rental rates in the subregion were applied.

7/ Based on prevailing tenure arrangements on each farm reflecting actual combinations of cash rent, net share rent, and owner-operator land allocations. Current values of owner-operated cropland are used in this calculation.

8/ The details in footnote (7) above apply with the exception that for owner-operated land the average value of cropland at time of acquisition is used.

# CUMULATION OF SOYBEAN PRODUCTION BY COST LEVELS

ALL SUBREGIONS



for 1974 of 27.1 bushels per acre.<sup>2</sup> Per unit cost estimates at the trend yield were made assuming per acre costs would have been the same as shown for the survey yield. This procedure may slightly underestimate such costs as harvesting that could increase with yields. The average total cost, excluding land, drops to \$2.54 at trend yield, \$0.25 per bushel below the cost at survey yields. Total direct costs averaged \$1.96 at trend yield. All other cost items are also approximately 10 percent less per bushel using trend rather than survey yields.

Considerable variability in the per bushel cost of producing soybeans among subregions was caused by differences in soybean yields and the quantities and prices of inputs applied. The cumulative distribution of production by cost level for direct and two alternative methods of calculating total costs is shown in the following figure. The cumulative distributions indicate the percentage of the production in the survey that was grown for less than a given cost level. Over 55 percent of the soybeans were grown in 1974 at a direct cost of less than \$2 per bushel, and 85 percent had direct costs of less than \$3. Almost 5 percent were grown at a direct cost exceeding \$4.50 a bushel. These figures correspond to the first column in the following table.

The line labeled "total 1" in the above figure includes direct costs, management, overhead, and the composite land allocation with owner-operated land charged interest on its current agricultural value (method 5). "Total 2" is the same as "total 1" except owner-operated land is included using acquisition prices (method 6). "Total 1" and "total 2" correspond to the fourth and fifth columns in the accompanying table, respectively. About 51 percent of the soybeans in the survey subregions were produced at a "total 2" cost of \$4.50 or less. However, only 30 percent of the production were grown for less than \$4.50 when interest is charged on the current agricultural value of land in calculating the land allocation ("total 1").

## Subregional Comparisons

A summary of per acre and per bushel averages of certain cost components for all soybean subregions is presented in table 23. The average costs vary considerably among subregions on both a per acre and a per bushel basis. The subregional averages of total direct costs ranged from a low of \$39 per acre in subregion GP-6 to \$78 per acre in SE-3. Average total cost excluding land varied between \$57 for GP-3 and \$93 for SE-9. Direct costs on a per bushel basis ranged between a low of \$1.56 in GP-6 to the \$3.92 high in SE-2. Average total costs excluding land ranged between \$2.19 per bushel for

<sup>2</sup>The national average yield as reported by the Statistical Reporting Service was 23.2 bushels per acre.

Table 23.--Soybeans: Harvested area, yield, and production costs by subregion and aggregate, survey results, 1974 <sup>1/</sup>

Subregion	: Harvested area	: Yield per acre	: Per acre : Per bushel	Average costs per harvested acre and per bushel		
				: Direct 2/		Total excluding land 3/
				: Per acre	: Per bushel	: Current land value 4/:Average land value 5/
: 1,000 ac.	: Bushels					-Dollars
SE-2	: 1,792	19.8	75.75	3.82	88.92	4.48
SE-3	: 278	22.7	78.07	3.44	91.29	4.03
SE-4-5	: 704	18.9	69.99	3.70	84.09	4.45
SE-7	: 1,483	21.2	60.45	2.86	73.30	3.47
SE-9	: 424	26.1	76.35	2.93	93.09	3.57
SC-1	: 4,197	21.8	57.03	2.62	72.04	3.30
SC-2	: 1,315	18.0	55.18	3.07	66.40	3.70
GP-3	: 859	21.1	43.48	2.06	57.11	2.71
GP-6	: 993	24.9	38.90	1.56	57.93	2.32
NC-2	: 4,064	28.3	45.57	1.61	62.00	2.19
NC-3	: 2,182	28.8	46.85	1.63	64.38	2.24
NC-4	: 3,160	28.2	50.73	1.80	68.09	2.41
NC-5	: 1,247	19.5	44.47	2.28	57.61	2.95
NC-7	: 889	27.1	50.69	1.87	67.50	2.48
NC-8	: 712	25.4	55.99	2.20	73.47	2.89
NC-9	: 8,820	27.7	52.47	1.89	69.96	2.53
NC-10	: 252	22.1	54.09	2.44	69.40	3.13
NC-12	: 2,998	21.7	54.62	2.52	67.92	3.14
NC-13	: 2,149	21.5	48.15	2.24	62.20	2.89
Total or weighted average:	: 38,517	24.7	53.18	2.16	68.85	2.79
					60.02	2.43
					44.96	1.82

<sup>1/</sup> These data are generally based on a survey of farms having more than 50 acres of cropland per farm in specified subregions. In some subregions, the minimum size of farm eligible for sampling was as high as 200 acres of cropland. Only nonirrigated production is included in these figures. Approximately 325,000 acres of irrigated production was omitted with little impact on the major cost categories.

<sup>2/</sup> Includes labor, power and equipment, materials, custom services, and interest on operating capital.

<sup>3/</sup> Includes direct costs, management, and overhead.

<sup>4/</sup> Based on prevailing tenure arrangements on each farm reflecting actual combinations of cash rent, net share rent, and owner-operator land allocations. Current values of owner-operated land are used in the calculation.

<sup>5/</sup> The details in footnote (4) above apply with the exception that for owner-operated land the average value of cropland at time of acquisition is used.

Soybeans: Distribution of production by cost levels, U.S. aggregate, 1974

Cost levels per bushel	Direct cost	Direct plus overhead costs	Direct plus overhead plus management	Direct plus overhead plus management plus land allocation using:	
				Current land values <sup>1</sup>	Average land values <sup>2</sup>
	Percent of production	Percent of production	Percent of production	Percent of production	Percent of production
<b>Less than—</b>					
\$1.00 .....	2.8	0.7	---	---	---
\$1.50 .....	30.6	17.7	3.4	---	---
\$2.00 .....	55.8	44.2	24.9	---	0.3
\$2.50 .....	74.3	65.1	49.9	0.3	2.0
\$3.00 .....	84.8	79.6	68.8	2.1	5.4
\$3.50 .....	89.6	86.9	81.3	5.2	16.1
\$4.00 .....	93.9	91.3	87.0	14.1	31.9
\$4.50 .....	96.2	94.5	91.7	29.8	51.0
\$5.00 .....	97.2	96.4	94.5	52.8	70.4
\$5.50 .....	98.3	97.3	96.3	69.1	82.1
\$6.00 .....	99.2	98.4	97.2	80.2	88.3
\$7.00 .....	99.6	99.6	99.1	90.2	94.8
\$8.00 .....	99.8	99.9	99.5	96.1	98.5

<sup>1</sup> Method 5 as defined in the text was used to calculate the land allocation. <sup>2</sup> Method 6 as defined in the text was used to calculate the land allocation.

NC-2 and \$4.48 in SE-2. In general, the subregions with highest averages for total costs excluding land on both a per acre and per bushel basis were in the southeastern United States. The subregions with the lowest averages represent parts of the western Corn Belt and Central Plains.

Average allocations to land also varied considerably among subregions as shown in table 23 for methods 5 and 6. The first composite, which included owner-operated land at current value (method 5), ranged from \$29 per acre in SE-2 to \$81 in NC-9. Converting to a per bushel basis the range is from the \$1.43 low in SE-3 to \$3.04 in NC-8. The second composite, which uses the average acquisition value for owner-operated land (method 6), showed a range from \$17 in SE-2 to \$64 in NC-9. The per bushel averages varied from \$0.87 in SE-2 to \$2.31 in NC-9. In general, the southeastern subregions had the lowest land allocations and the central Corn Belt areas showed the highest. The lower land allocations in the Southeast tended to offset higher nonland costs in these areas.

Detailed breakdowns of costs for four of the major subregions are shown in table 24 to illustrate some of the differences in production practices and costs among areas. An average of less than \$1 per acre was spent on fertilizer in NC-2

compared to \$20 in SE-2. This difference results from 89 percent of the planted acres receiving fertilizer in SE-2 compared to only 8 percent in NC-2. Similar differences are shown for insecticides at \$5 per acre in SE-2 compared to near zero expenditures in NC-2 and NC-9. Farmers in subregion SE-2, on the average, also spend several times as much on custom services as the other three subregions shown. However, the per acre cost of labor, power and equipment, herbicides, overhead, and management tended to show less variability among the subregions.

### Costs for 1975

Detailed estimates of costs for 1975 have not yet been prepared for publication but some general observations can be made. Prices for most factors used to grow soybeans were higher in 1975 than 1974, causing per acre costs to rise. However, the 1975 national average yield was 5 bushels per acre higher than for 1974. As a result, the per bushel average total cost, excluding land, of producing soybeans in 1975 was probably above the \$2.54 average calculated for 1974 at trend yield but still below the \$2.79 average cost for 1974 at survey yields. More specific estimates will be published when available.

Table 24--Soybeans: Production costs per acre harvested and per bushel, by cost item, specified subregions, 1974 1/

Item	Subregion SE-2			Subregion SC-1 2/			Subregion NC-2			Subregion NC-9		
	Cost per acre	Cost per bushel	Cost per acre	Cost per bushel	Cost per acre	Cost per bushel	Cost per acre	Cost per bushel	Cost per acre	Cost per bushel	Cost per acre	Cost per bushel
Labor	5.90	0.30	7.61	0.35	7.21	0.25	6.17	0.22	6.17	0.20	6.17	0.22
Power and equipment	21.32	1.08	26.75	1.23	20.46	0.72	22.17	0.80	22.17	0.80	22.17	0.80
Fuel and lubricants	6.58	0.33	8.14	0.37	5.97	0.21	6.53	0.24	6.53	0.24	6.53	0.24
Repairs	4.00	0.20	5.54	0.25	3.98	0.14	3.71	0.13	3.71	0.13	3.71	0.13
Reserve for replacement	6.53	0.33	7.77	0.36	6.70	0.24	7.28	0.26	7.28	0.26	7.28	0.26
Interest and rental	4.22	0.21	5.30	0.25	3.81	0.13	4.65	0.16	4.65	0.16	4.65	0.16
Materials	39.49	1.99	17.87	0.82	14.44	0.51	21.05	0.76	21.05	0.76	21.05	0.76
Seed	8.42	0.42	9.80	0.45	7.59	0.27	8.68	0.31	8.68	0.31	8.68	0.31
Fertilizer and lime	19.98	1.00	1.53	0.07	0.91	0.03	5.51	0.20	5.51	0.20	5.51	0.20
Insecticides and fungicides	5.41	0.27	0.40	0.02	0.02	---	0.01	---	0.01	---	0.01	---
Herbicides	5.37	0.27	5.99	0.27	5.90	0.21	6.76	0.24	6.76	0.24	6.76	0.24
Other materials	0.32	0.02	0.15	0.01	0.03	---	0.09	---	0.09	---	0.09	---
Custom services	6.04	0.30	2.45	0.11	2.14	0.08	1.38	0.05	1.38	0.05	1.38	0.05
Interest on operating capital	3.00	0.15	2.35	0.11	1.32	0.05	1.70	0.06	1.70	0.06	1.70	0.06
<b>TOTAL DIRECT COSTS</b>	<b>75.75</b>	<b>3.82</b>	<b>57.03</b>	<b>2.62</b>	<b>45.57</b>	<b>1.61</b>	<b>52.47</b>	<b>1.89</b>	<b>52.47</b>	<b>1.89</b>	<b>52.47</b>	<b>1.89</b>
Overhead	5.43	0.27	6.65	0.30	5.45	0.19	6.00	0.22	6.00	0.22	6.00	0.22
Management	7.74	0.39	8.36	0.38	10.98	0.39	11.49	0.42	11.49	0.42	11.49	0.42
<b>TOTAL EXCLUDING LAND</b>	<b>88.92</b>	<b>4.48</b>	<b>72.04</b>	<b>3.30</b>	<b>62.00</b>	<b>2.19</b>	<b>69.96</b>	<b>2.53</b>	<b>69.96</b>	<b>2.53</b>	<b>69.96</b>	<b>2.53</b>
Alternative land allocations:												
Ownership basis:												
At current land value 3/	38.48	1.94	44.82	2.05	96.84	3.42	105.08	3.79	105.08	3.79	105.08	3.79
At average acquisition value 4/	13.29	0.67	16.39	0.75	40.37	1.42	43.87	1.58	43.87	1.58	43.87	1.58
Share rent basis 5/	32.41	1.64	40.33	1.85	77.71	2.74	75.41	2.72	75.41	2.72	75.41	2.72
Cash rent basis 6/	22.53	1.14	25.86	1.18	45.52	1.61	44.28	1.60	44.28	1.60	44.28	1.60
Composite basis:												
At current land value 7/	29.27	1.48	36.49	1.67	80.16	2.83	80.93	2.92	80.93	2.92	80.93	2.92
At average acquisition value 8/	17.33	0.87	22.78	1.04	60.48	2.13	64.04	2.31	64.04	2.31	64.04	2.31

1/ Items may not add due to rounding.

2/ Includes nonirrigated production only.

3/ Based on estimated current agricultural value of cropland multiplied by current rates of interest on Federal Land Bank mortgage loans.

4/ Based on estimated average value of cropland at time of acquisition by present owners multiplied by current rates of interest on Federal Land Bank mortgage loans.

5/ Net share rent is the landlord's share of crop receipts minus his share of the crop expenses. If the operator did not share rent, prevailing share rent terms in the subregion were applied.

6/ Based on average cash rent payments per acre of cropland. If the operator did not cash rent, prevailing average cash rental rates in the subregion were applied.

7/ Based on prevailing tenure arrangements on each farm reflecting actual combinations of cash rent, net share rent, and owner-operator land allocations. Current values of owner-operated cropland are used in this calculation.

8/ The details in footnote (7) above apply with the exception that for owner-operated land the average value of cropland at time of acquisition is used.



